ENVIRONMENT AUDIT REPORT

SREE NARAYANA COLLEGE CHATHANOOR

2022-23

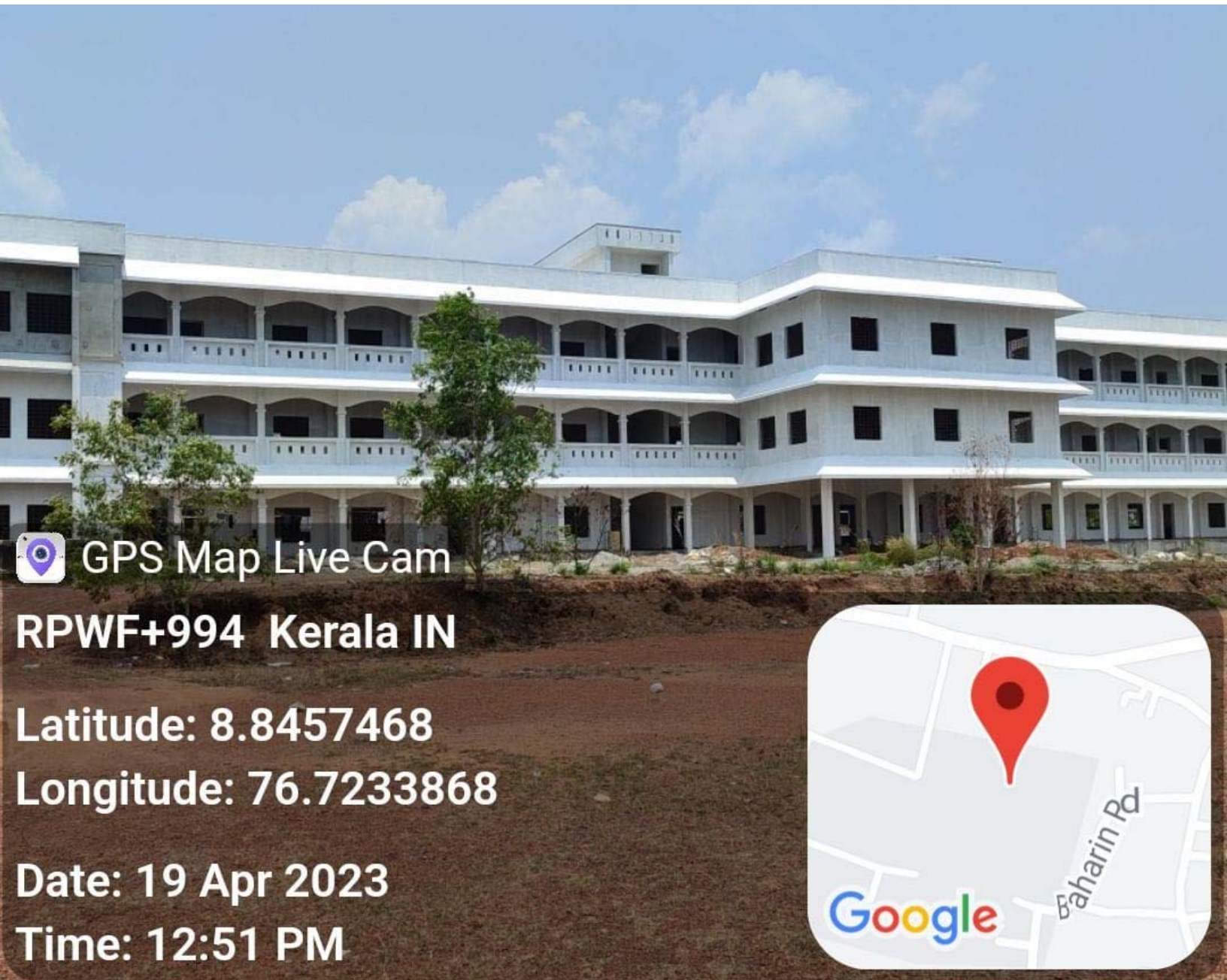# ENVIRONMENT AUDIT REPORT

SREE NARAYANA COLLEGE

CHATHANOOR

GPS Map Live Cam

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Environment Audit Report
SREE NARAYANA COLLEGE, CHATHANOOR
EA 987, 2023

Audit Team

Ottotractions

1	Er. Suresh Babu B V,	Accredited Energy Auditor, AEA 33
2	Er. B. Zachariah,	Director, Ottotractions
3	Er. Abin Baby,	Project Engineer,
4	Er. Devan J	Project Engineer,
5	Er. Jomon J S	Project Engineer,
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7	Ms. Anjana	Project Assistant

About OTTOTRACTIONS

OTTOTRACTIONS established in 2005, is an organization with proven track record and knowledge in the field of energy, engineering, and environmental services. They are the first Accredited Energy Auditor from Kerala for conducting Mandatory Energy Audits in Designated Consumers as per Energy Conservation Act-2001. Government of Kerala recognized and appreciated OTTOTRACTIONS by presenting its prestigious "The Kerala State Energy Conservation Award 2009" for the best performance as an Energy Auditor. Ottotractions is an ISO 9001-2015 and ISO 14001-2015 Certified organization, which ensures the quality of its services.

Acknowledgment

We were privileged to work together with the administration and staff of Sree Narayana College, Chathanoor for their timely help extended to complete the audit and bringing out this report.

With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

We also take this opportunity to thank the bona-fide efforts of team OTTOTRACTIONS for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency
Government of India

Contents

INTRODUCTION

Sree Narayana College, Chathanoor has entrusted Ottotractions to carry out an environmental audit of their campus building.

Each section contains recommendations for improvements relating to environmental issues, which are consolidated in the action plan in section 4.
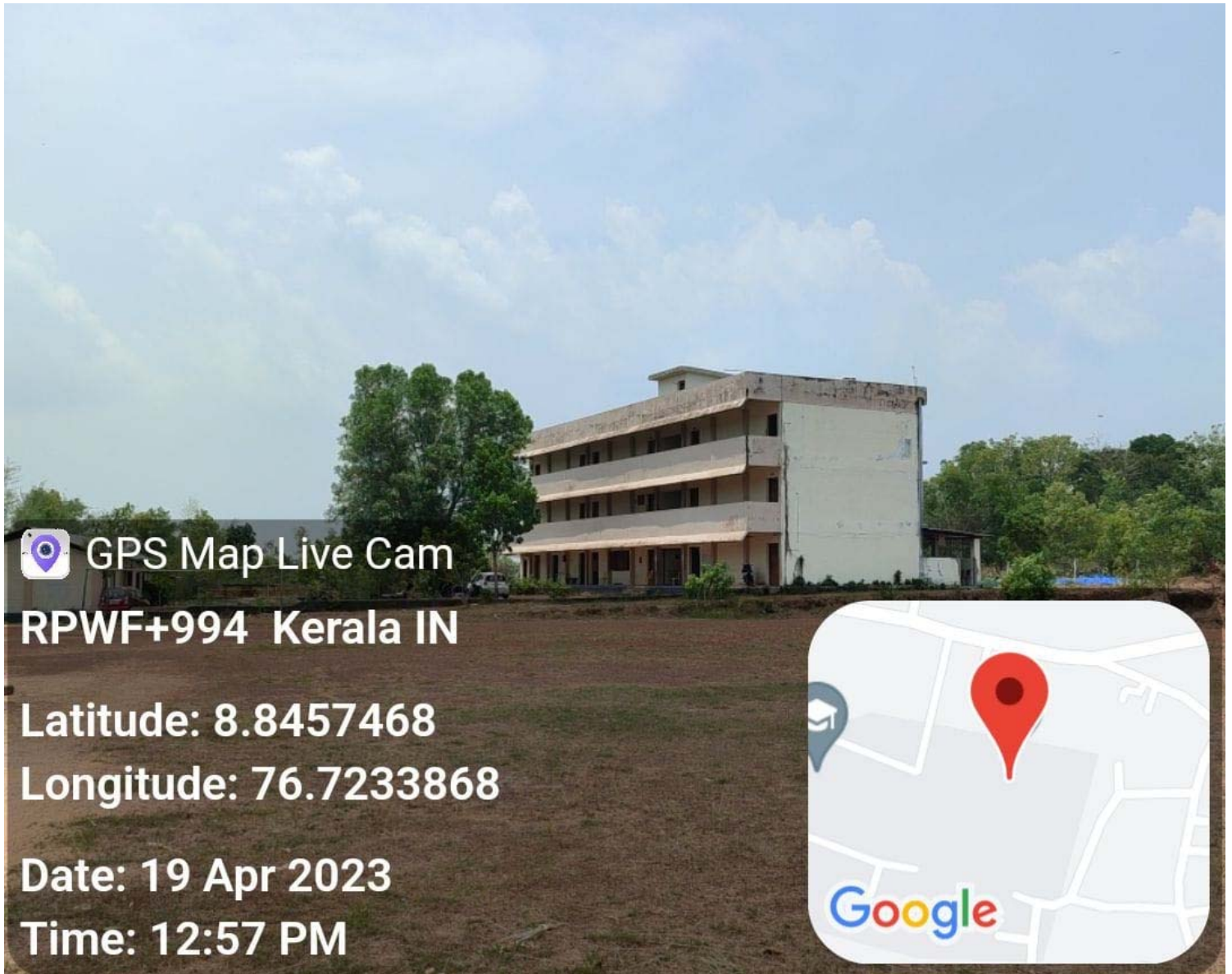
BACKGROUND

Sree Narayana College, Chathannur situates at Karamcode, near to the KSRTC Bus Station Chathannur in Kollam district in Kerala. The College is managed by the Sree Narayana Trusts, Kollam, one of the leading educational agencies in the state. It is affiliated to the University of Kerala, and has 12 B recognition from the UGC.

The first Principal of the college was the noted academician Prof. K. Udayakumar. Ever since its inception in 1981, Sree Narayana College, Chathannur has catered to the educational and intellectual needs of young men and women from the rural areas of south Kollam.

The college offers degree courses in Mathematics, Commerce, Chemistry & Industrial Chemistry and History. At the Post-Graduate level, the college offers M.Sc Mathematics and M.Com (Finance stream). Various clubs and study centers function to encourage and nurture the aesthetic and literary talents of its members.

Occupancy Details	
Particulars	2022-23
Total Students	600
Staffs	30
Total Occupancy of the college	630

Total student strength of the campus is 630. For calculating per capita carbon emission estimation, the student strength is taken into account.

ENVIRONMENTAL ISSUES

This section is broken down into the following different areas: waste, water, energy, resource and materials use and procurement. A final 'other' section is also included for any additional issues.

1.1. Waste

The way communities generate and manage their waste plays an absolutely key role in their ability to use resources efficiently. All buildings contain bins for both general waste and mixed recyclables (plastic bottles, card, cans and paper). On average each floor in the buildings areas has its own general waste bin and one recycling bin. When

the bins are emptied by the cleaning staff. Bins are marked and kept in different colors for identification, however in some locations throughout the building it was unclear which bins were for which waste streams.

There are four basic ways in which campus can do **plastic** recycling **collection** services for **plastic** bottles and containers – curbside, drop-off, buy-back or deposit/refund programs. The first, and most widely accessible, **collection** method is curbside **collection** of recyclables. The campus is installed bins to collect plastic bottles and single use plastics. The college has given a proper awareness on plastic waste problems and they are discouraging the students or teachers to carry plastics to the campus. The Bhoomitra Sena Club is very active in the campus and do a verity of programs to build awareness on waste management. The reports on different activities of the club are attached as technical supplement of this report.

The major concern of waste management will be focused on the solid waste produced by the campus. Solid wastes produced in the campus are mainly of three types, food waste, paper waste, and plastic waste. Food wastes produced in the campus are mainly by two means. The vegetable wastes produced in the kitchen during the food preparation. The food waste produced by the students and staffs of the campus after the consumption of meals. The degradable waste is treated in the biogas plant, the biogas generated is used in the kitchen. A state of art sewage treatment plant is installed in the campus

Degradable Waste Generation	
Sree Narayana College, Chathanoor	
	2022-23
Total Occupancy	630
Waste generated in kg /day	12.6
Waste generated in kg /Yr	1512

Burning plastics shall be strictly restricted inside the campus. **Burning plastic** and other wastes releases dangerous substances such as heavy metals, Persistent Organic Pollutants, and other toxics into the air and ash waste residues. Such pollutants contribute to the development of asthma, cancer, endocrine disruption, and the global burden of disease.

Solid non degradable Waste Generation	
Sree Narayana College, Chathanoor	
	2022-23
Total Occupancy	630
Waste paper generated in kg /day	0.126
Waste plastic generated in kg /day	0.189
Waste paper generated in kg /Yr	15.12
Waste plastic generated in kg /Yr	22.68

WASTE MINIMIZATION AND RECYCLING

1	Does your institute generate any waste? If so, what are they?	Yes, Solid waste, Canteen waste, paper, plastic, Horticulture Waste etc.
2	What is the approximate amount of waste generated per day? (in Kilograms/) (approx.)	12.6
3	How is the waste generated in the institute managed? By	Reuse of one side printed Paper for internal communication. Kitchen waste is used to generate manures and biogas. Two types of Waste bins are provided at campus for biodegradable and non-biodegradable waste.
	1 Composting	In-house
	2 Recycling	In-house
	3 Reusing	In-house
	4 Others (specify)	
4	Do you use recycled paper in institute?	Yes
5	Do you use reused paper in institute?	Yes
6	How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify.	Number of awareness programs through Bhoomitra Sena Club, Biodiversity Club and NSS Camp
7	Can you achieve zero garbage in your institute? If yes, how?	Not yet achieved. Possible through waste management plan.

Green Cover Audit

1	**Is there a garden in your institute?**	**Yes**	
2	Do students spend time in the garden?	Yes	
3	Total number of Plants in Campus	Plant type	Approx. number
		Trees	18
		Ornamental	25
4	Number of Tree Plantation Drives organized by School per annum. (If Any)	Yes, through Bhoomitra Sena Club and Biodiversity club plantation drives are organized.	

| 5 | Number of Trees Planted in Last FY. | 30 |
| | Survival Rate | 100% |

All the activities including energy consumption and waste management have their equivalent carbon emission and they positively contribute to the carbon footprint of the campus. Carbon sequestration is the reverse process, at which the emitted carbon dioxide will get sequestrated according to the type of carbon sequestration employed. Even though there are many natural sequestration processes are involved in a campus, the major type of sequestration among them is the carbon sequestration by trees.

Trees sequestrate carbon dioxide through the biochemical process of photosynthesis and it is stored as carbon in their trunk, branches, leaves and roots. The amount of carbon sequestrated by a tree can be calculated by different methods. In this study, the volumetric approach was taken into account, thus the details including CBH (Circumference at Breast Height), height, average age, and total number of the trees, are required. Detailed table is included in the technical supplement.

Carbon Sequestration	
Particulars	2022-23
Carbon sequestrated by trees in the campus (tCO2e)	1.02

Carbon sequestrated by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree

- Determining the dry weight of the tree

- Determining the weight of carbon in the tree
- Determining the weight of CO_2 sequestrated in the tree
- Determining the weight of CO_2 sequestrated in the tree per year

Carbon sequestrated by each species of trees in the campus compound is given in the Table. Detailed calculation results are listed out in the tables provided in the technical supplements of 'Carbon sequestration'.
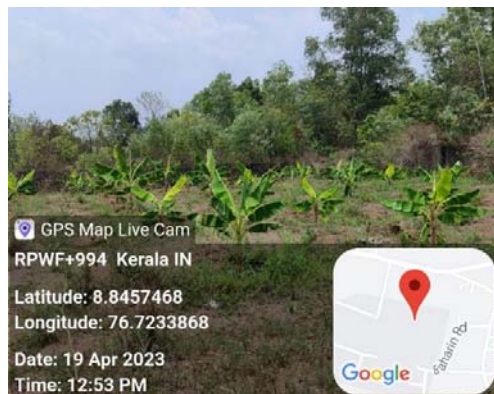
List of Trees in the Campus (above 15 cms growth)		
Sl No	Name	Number
1	Teak	5
2	Mahagoni	8
3	Jack fruit	5
Total		18

3.1.1 ENERGY

a. Electricity

The total emission of the carbon dioxide per student is 26.03 kg per year. Emission reduction plans were prepared to bring the existing per capita carbon footprint to zero or below so as to bring the campus a carbon neutral or carbon negative campus. All energy efficiency projects and renewable Energy shall be implemented, So, the effective specific carbon emission per student is -4.73 kg of CO_2 per year only

This can be achieved in many ways but, every alternate plan must be in such a way that, it must fulfill the actual purpose of each activity that is considered.

Here, three major methods are taken in to account as the plans for reducing the carbon emission of the campus.

- Resource optimization
- Energy efficiency
- Renewable energy

Electricity Consumption

Electricity Connection Details		
Sree Narayana College, Chathanoor		
1	Name of the Consumer	Sree Narayana College, Chathanoor
		Chathanoor
2	Tariff	LT-6A General
3	Consumer Number	1145751027868, 1145754004277
4	Connected Load Total (kW)	
5	Annual Electricity Consumption (kWh)	17516

Annual Electricity Consumption (kWh)		
Sl.No	Consumer No	2022-23
1	1145751027868	7972.7143
2	1145754004277	9543
	Total	17516

RESOURCE OPTIMISATION

The effective use of resources can limit its unnecessary wastage. Optimal usage of the resources (such as fuels) can save the fuel and can also reduce the carbon emission due to its consumption. This technique can be effectively implemented in the 'transportation' and 'waste' sectors of the campus.

WASTE MINIMISATION

Optimal utilization of paper and plastic stationaries can reduce the frequency of purchase of items. This can reduce the unnecessary wastage of money as well as the excess production of waste. In the case of food, proper food habits and housekeeping practices can optimize its usage.

Currently, the College is taking an appreciable effort to reduce the unnecessary production of wastes. But the campus still has opportunities to reduce the generation of waste and can improve much more. Resource optimization can be effectively implemented in all type of waste generated in the campus and the campus can expect about 50% reduction the total waste produced.
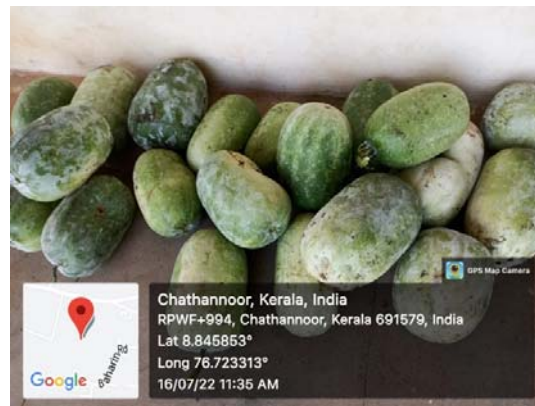
ENERGY EFFICIENCY

Energy efficiency is the practice of reducing the energy requirements while achieving the required energy output. Energy efficiency can be effectively implemented in all the sectors of the campus.

FUELS FOR COOKING

The campus can install a solar water heater to rise the water temperature to a much higher level, then it has to consume only very less amount of thermal energy for preparing the same amount of food. This can make a positive benefit to the campus by saving money, energy and can reduce the carbon emission of the campus due to thermal energy consumed for cooking.

TRANSPORTATION

Energy efficiency of the transportation sector is mainly depended on the fuel efficiency of the vehicles used. Here mileage of the vehicle (kmpl - Kilometres per Litre) is calculated to assess the fuel efficiency of the vehicle. Percentage of closeness is the ratio of actual mileage of the vehicle to its expected mileage. If the percentage of

closeness of mileages of each vehicle is greater than that of its average, then the efficiency status of the vehicle is considered as 'Above average' and else, it is considered as 'Below average'

Renewable Energy

2kWp Solar power plant is installed in the campus which helps offsetting the carbon foot print. The details of these projects are given in the concerned chapters.

After analyzing the historical and measured data the following projects are proposed to make the campus carbon neutral. The projects are from energy efficiency and renewable energy. The further additions in the green cover increase will also give positive impact in the carbon mitigation.

	OTTOTRACTIONS- ENERGY AUDIT					
	Sree Narayana College, Chathanoor					
	Greenhouse Gas Mitigation through Major Energy Efficiency Projects					
Sl No	Projects	Energy saved(Yearly)		Sustainability (Years)	First year ton of CO_2 mitigated	Expected Tons of CO_2 mitigated through out life cycle
		(kWh)	MWh	Years		
1	Energy Saving by replacing existing 95No's in-effecent ceiling fans with Energy Efficient Five star fans/BLDC Fans	3344	3.34	10	2.74	27.42
	Total	3344	3	30	2.74	27

General Environmental Awareness Questionnaire	
Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
Does your institute have any rules to protect the environment? List possible rules you could include.	Yes
Dose Environmental Ambient Air Quality Monitoring conducted by the Institute?	No
Dose Environmental Water and Wastewater Quality monitoring conducted by the Institute?	Yes
Dose stack monitoring of DG sets conducted by the Institute?	No
Is any warning notice, letter issued by state government bodies?	No
Dose any Hazardous waste generated by the Institute? If yes explain its category and disposal method	No
Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
Does your institute have any rules to protect the environment? List possible rules you could include.	Yes
Does housekeeping schedule in your campus?	Yes
Are students and faculties aware of environmental cleanliness ways? If Yes Explain	Yes
Does Important Days Like World Environment Day, Earth Day, and Ozone Day etc. eminent in Campus?	Yes
Does Institute participate in National and Local Environmental Protection Movement?	Yes
Does the institute have any Recognition/certification for environment friendliness?	Yes
Does the institute use renewable energy?	Yes
Does the Institution conduct a green/environmental audit of its campus?	Yes
Has the institution been audited / accredited by any other agency such as NABL, NABET, TQPM, NAAC etc.?	Yes (NAAC)

Best Practices and Initiatives	
Renewable Energy	Yes
Solar Power Plant	Yes
Energy Audit and Green Audit Conducted	Yes
Biogas Plant installed	No
Biodiversity Conservation	Yes
Green Cover	Yes
Tree Plantation Drives	Yes
ECO clubs	Yes
Groundwater Recharge	Yes
Rain Water Harvesting System.	Yes
Pollution Reduction Public Transportation	Yes
E Waste Management	NO
Connected to authorized recycler	NO
Solid Waste Management	Yes
Lifting of garbage from the campus on alternate days by the Municipal Corporation.	No
Adoption of Village	NO
CSR	Yes
Water Conservation	Yes
Energy Conservation	Yes

RECOMMENDATIONS

1. Implement a utility monitoring program.

   - Allocate staff to carry out meter readings for electricity, waste and water on regular basis

   - Add monitoring data to spreadsheet so results can be viewed graphically

   - Compare with the utility bills meter readings in order to ensure accuracy;

2. Consider adopting and implementing a sustainable procurement policy which takes into account the whole life cycle of a product, and make sure environmental issues are written into tenders when contracting out.

3. Consider trialing recycled paper again – many recycled brands today, such as Evolve, are just as good as virgin paper.

4. Trial the use of re-manufactured (i.e., refilled) ink and toner cartridges rather than purchasing new ones.

5. Consider producing some designated 'environmental' pages on the intranet to make it easier for staff to find environmental information. If possible, a discussion forum could be set up to allow easy internal communications and staff to make suggestions for environmental improvements.

6. Environmental training could be formalized and carried out for all staff. It does not have to be too long or onerous, providing it covers key points, particularly in relation to waste so all staff are aware of the legal requirements. At the very least, environmental information should be included in the induction pack.

7. It is strongly recommended that environmental information is also given to students and staff during induction. It is particularly important for them to be aware of what waste they can dispose of on site and where they can dispose of it, and what waste streams they must take away with them.

8. Consider implementing an environmental management system to incorporate all improvements and monitoring requirements. It does not need to be a complex system certified to any particular standard, merely a way of ensuring that baselines are set and progress is measured. Formation of Environment Policy and communicated to all faculties and other staff.

9. Plan for Zero Waste Campus Project

10. E-waste monthly inventory be maintained at campus as per E waste rules 2016.

11. A Water Meter should be installed at the institute for monitoring of water consumption per capita.

12. Increase in Environmental promotional activities for spreading awareness at campus.

13. Environment/Green committee formation for regulating eco-friendly initiatives at campus premises and periphery.

Chathannoor, Kerala, India
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CONCLUSION

This audit involved extensive consultation with all the campus team, interactions with key personnel on a wide range of issues related to Environmental aspects. The audit has identified several observations for making the campus premise more environmentally friendly. The recommendations are also mentioned with observations for Sree Narayana College, Chathanoor team to initiate actions.

Carbon Foot Print			
Sl. No.	Particulars	2021-22	tCO2e
1	Electricity (kWh)	20071	16.46
2	Diesel (L)	300	0.96
3	LPG (kg)	228	0.34
4	Biogas (M3)	0	0.00
5	Degradable Waste in kg/yr.	1512	0.95
6	Paper Waste in kg/yr	15	0.01
7	Plastic Waste in kg/yr	23	0.01
Total Carbon Foot Print tCO2e/yr			18.73

Net Carbon Emission after implementing Energy Efficiency projects and Renewable Energy Projects Proposed		
1	Total Carbon Foot Print tCO2e/yr	18.73
2	Carbon Sequestrated tCO2e/yr	1.02
3	Carbon mitigated by Renewable Energy tCO2e/yr (Installed)	2.10
3	Carbon mitigated by Renewable Energy tCO2e/yr (Proposed)	15.71
4	Carbon mitigated by Energy Efficiency (Proposed) tCO2e/yr	2.74
5	Effective Carbon footprint tCO2e/yr	-2.84
6	Total No of Students	600
7	Specific Carbon Footprint kg CO2e/Student/Yr	-4.73

However, there is scope for further improvement, particularly in relation to waste minimization and energy monitoring. By implementing a basic environmental management system, current good practice can be formalized and a framework can be set up for monitoring, implementation of action plans and continual improvement.

The audit team observed that the overall site is maintained well from an environmental perspective. There are no major observations but few things are important to initiate urgently are waste management records by monthly inventory of hazardous waste, rainwater harvesting recharge; water balance cycle and periodic inspection of buildings; environment policy and initiation of composting at campus.

References

- The Environment [Protection] Act – 1986 (Amended 1991) & Rules-1986 (Amended 2010)

- The Petroleum Act: 1934 – The Petroleum Rules: 2002

- The Central Motor Vehicle Act: 1988 (Amended 2011) and The Central Motor Vehicle

- Rules:1989 (Amended in 2005)

- Energy Conservation Act 2010.

- The Water [Prevention & Control Of Pollution] Act – 1974 (Amended 1988) & the Water (Prevention & Control of Pollution) Rules – 1975

- The Water [Prevention & Control Of Pollution] Cess Act-1977 (Amended 2003) and Rules- 1978

- The Air [Prevention & Control Of Pollution] Act – 1981 (Amended 1987) The Air (Prevention

  & Control of Pollution) Rules – 1982

- The Gas Cylinders Rules – 2016 (Replaces the Gas Cylinder Rules – 1981

- E-waste management rules 2016

- Electrical Act 2003 (Amended 2001) / Rules 1956 (Amended 2006)

- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)

- The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)

- The Batteries (Management and Handling) rules, 2001 (Amended 2010)

- Relevant Indian Standard Code practices

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GPS Map Camera

TECHNICAL SUPPLEMENTS

SI.No	Location	Lights			Fans		IT			Others	
		T12	LEDT	LEDB	CF	WF	Printer	Projector	PC	Mixer	Fridge
1	Staffroom		2		2				1		
2	PG Maths		2		2	1	1		1		
3	Class 1		2		4						
4	BSc Maths		2		4						
5	Class 2		2		4						
6	Physics Lab		2		8						
7	Department of Chemistry		9		2	1					
8	Chemistry Lab		4		2						
9	Outdoor		2		1						
10	Chemistry Lab 2		4		2						
11	NCC office		1		1						
12	Office		2		2				1		
13	Passage		5								
14	10 Rooms		10		20						
15	Study Hall		6		8						
16	Store	1			2						
17	Kitchen		2		1					1	1
18	Dining room		6		6						
19	Office		4		5		2		2		
20	Principal		4		3		2		2		
21	Library		6		3						
22	PG		2		2	1	1		1		
23	Classroom		2	1	1						
24	Mcom		2		2						
25	MSc		1		1						
26	Mcom 2				1						
27	Computer Lab		4					1	20		
28	Room No 8		2		2						
29	Room No 9		2		2						
30	Room No 7		2		2						
	TOTAL	1	94	1	95	3	6	1	28	1	1